What is claimed is:

1. A process for preparing xylylenediamine by continuously hydrogenating liquid phthalonitrile over a heterogeneous catalyst in the presence of liquid ammonia in a reactor, in which a portion of the reactor effluent is recycled as a liquid circulation stream continuously to the reactor inlet (circulation mode), which comprises conducting a stream of a phthalonitrile melt in liquid form by means of a mixer unit into the circulation stream around the hydrogenation reactor, the phthalonitrile conversion in the reactor on single pass being greater than 99%, and the circulation stream consisting to an extent of greater than 93% by weight of liquid ammonia and xylylenediamine and not comprising any further solvent for phthalonitrile.

2. The process according to claim 1 for preparing meta-xylylenediamine by hydrogenating isophthalonitrile.

3. The process according to claims 1 or 2, wherein the mixer unit is heated at the point of the phthalonitrile supply into the circulation stream to a temperature in the range from 1 to 40°C above the melting point of the phthalonitrile used.

4. The process according to any of the preceding claims, wherein the liquid phthalonitrile is sprayed into the circulation stream by means of a mixer nozzle as the mixer unit.

5. The process according to any of the preceding claims, wherein the phthalonitrile conversion in the hydrogenation reactor on single pass is greater than 99.5%.

6. The process according to any of claims 1 to 4, wherein the phthalonitrile conversion in the hydrogenation reactor on single pass is greater than 99.9%.

7. The process according to any of the preceding claims, wherein the circulation stream consists to an extent of greater than 94% by weight of liquid ammonia and xylylenediamine.

8. The process according to any of the preceding claims, wherein the circulation stream contains in the range from 25 to 90% by weight of liquid ammonia.

9. The process according to any of the preceding claims, wherein the portion of the liquid reactor effluent which is recycled as the circulation stream continuously to the reactor inlet makes up from 20 to 95% by weight of the overall liquid reactor effluent.

10. The process according to any of the preceding claims, wherein the weight ratio of phthalonitrile feed stream to circulation stream is in the range from 0.03 to 1.0.

11. The process according to any of the preceding claims, wherein the hydrogenation is carried out at a temperature in the range from 40 to 150°C.

5   12. The process according to any of the preceding claims, wherein the hydrogenation is carried out at an absolute pressure in the range from 100 to 300 bar.

13. The process according to any of the preceding claims, wherein the hydrogenation is carried out over a catalyst comprising Ni, Co and/or Fe, as an unsupported
10   catalyst or on an inert support.

14. The process according to any of the preceding claims, wherein the hydrogenation is carried out over a manganese-doped unsupported cobalt catalyst.

15   15. The process according to any of the preceding claims, wherein the catalyst is disposed as a fixed bed in a tubular reactor or tube bundle reactor.

16. The process according to the preceding claim, wherein the reactor is operated in trickle mode.

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17. The process according to any of the preceding claims, wherein the reactor is operated adiabatically.

18. The process according to any of the preceding claims, wherein heat is withdrawn
25   from the circulation stream in a cooler.

19. The process according to any of the preceding claims, wherein the xylylenediamine is purified after the hydrogenation by distilling off the ammonia and also any relatively low-boiling by-products overhead and distillatively
30   removing relatively high-boiling impurities via the bottom.

20. The process according to the preceding claim, wherein the xylylenediamine is extracted after the distillation with an organic solvent for further purification.

35   21. The process according to the preceding claim, wherein cyclohexane or methylcyclohexane are used for the extraction.